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Authors

FRED MILESHKO

Anyone who's been botanizing with Fred knows that he is inseparable from his Nikon camera mounted on that odd-looking Benbo tripod. He carries them everywhere. He's proof to all those out there that the rule to *always* use a tripod *can* be followed! Since retiring to Georgia and joining the BotSoc, Fred spends much of his time photographing the natural wonders of the southeast. You will surely enjoy his photos.

JOHNNY STOWE

Johnny Stowe is a native of Cedartown, GA, which lies in the Ridge and Valley near the Cartersville Fault. He is presently in exile in South Carolina, where he coordinates management of the state's 66 heritage preserves, including many longleaf pine ecosystems. His passions are native ecosystem restoration, prescribed burning, hunting, and eradication of invasive exotic species. Montane longleaf pinelands are his favorite ecosystem.

MORGAN VARNER

Morgan Varner is a graduate research assistant in fire and restoration ecology at the University of Florida. His master's thesis work was based at Fort McClellan (near Anniston, AL), considered by many to be the most intact montane longleaf pineland in existence. His interests are pinelands conservation, fire, the natural history of Alabama (his home), and his ever-growing family.

JOHN McGUIRE

For decades, the gently rolling, longleaf pine sand hills of Richmond County, Georgia were home to the ancestors of John McGuire. Today the woody tentacles of longleaf pine roots, twist amongst these ancestral human bones while a covey of bobwhite quail find refuge amid the bricks of their decaying homestead foundations. Perhaps it is something deeply ingrained and passed on by these yeomen sand-hillers that has created John's fondness for the sweet aroma of pine perfume, the gentle resonance of cicadas in the summer, and the excitement inspired by a wood's fire. John is currently the regional outreach coordinator for the Longleaf Alliance; a grassroots organization attempting to raise public awareness of longleaf pine forests. He resides in Auburn, AL.

KARIN HEIMAN

Karin Heiman has been a consulting biologist in Western North Carolina since 1985. She "converted" to BotSoc membership four years ago after starting the Chattahoochee project. Though she is rather partial to lichens, she is enthusiastic about vascular plants. Her areas of experience include environmental impact statements, biological assessments, wetland delineation and determination, forest community typing and mapping, natural area reconnaissance, land use planning, rare species search and survey, design and implementation of monitoring projects, teaching short courses, and lichenological studies. This work has entailed contracting with nearly every state and Federal agency, The Nature Conservancy and other land trusts, and numerous engineering firms.

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A Few Favorite Wildflowers

Fred Mileshko

Walking, driving along a road, hiking a trail, or exploring a county or state park can provide opportunities to observe and photograph wildflowers, many of which can become favorites.

Troutlily (*Erythronium umbilicatum*) is an exciting yellow flower that blooms in batches early in March. Troutlily is often found along areas of the Chattahoochee River with toad trillium (*Trillium cuneatum*) and bloodroot (*Sanguinaria canadensis*) and all are candidates for favoritism. Other enjoyable wildflowers blooming throughout the growing season are Asiatic dayflower (*Commelina communis*), daily producing a brand new flower which has a pair of blue upper petals and a third, small white one; the umbrella-like mayapple (*Podophyllum peltatum*) which has, beneath giant leaves, a white-petaled flower with a creamy yellow center; the rare lily-of-the-valley (*Convallaria majuscula*), a delicate plant found in the mountains of north Georgia with large sheathing leaves and dangling one-half inch frail bell-shaped fragrant white flowers; and the brilliant red cardinal flower (*Lobelia cardinalis*) whose midsummer blooms make a breathtaking sight along roadside ditches and waterways.

Fred and one of his favorites

Some wildflowers save their blooming for a display of beauty when the woods are bare and the frost is around the bend. Fringed gentian (*Gentianopsis crinita*) opens its blue petals in full sunlight and shows its deeply fringed corolla on tall stems to the world. The bog or fragrant lady's tresses (*Spiranthes odorata*) has sweet white flowers arranged in a spiral, thus the meaning of *Spiranthes* as "coil-flower." The arrangement of the tiny flowers on the braid-like spike is especially attractive to the chief pollinator, the bumblebee. Bumblebees start "nectarizing" at the bottom of one spike, then work upward, receiving pollen from some of the younger flowers near the top. Then, when the bees start again on the next spike, pollen is deposited on those flowers that open first at the bottom.

Another potential favorite which is found in an entirely different environment from those listed above is Curtiss' milkwort (*Polygala curtissii*). Curtiss' milkwort can be found from June to October in shallow soil rock depressions with yellow-tipped rose-purple petals.

Of all these wildflowers, and others, I have chosen four favorites that I have photographed, printed, framed, and hung on my favorite wall at home.

Fire Pink
Silene virginica

One of the brightest flowers, with its brilliant red whorl of five petals which are deeply notched at the top, is fire pink (*Silene virginica*) (Figure 1). Occurring throughout the mountains and Piedmont, the petals of fire pink found in southern states are more deeply notched than those further north.

In the Smoky Mountains, the plant is found at elevations of 1500 to 2500 feet along roads, trails and dry, steep banks. In April, it is seen at lower elevations, while in May through June the plant can be found at the higher levels. In other locations, fire pink is native to rocky, dry, thin woodlands, road banks, forest edges, and exposed slopes.

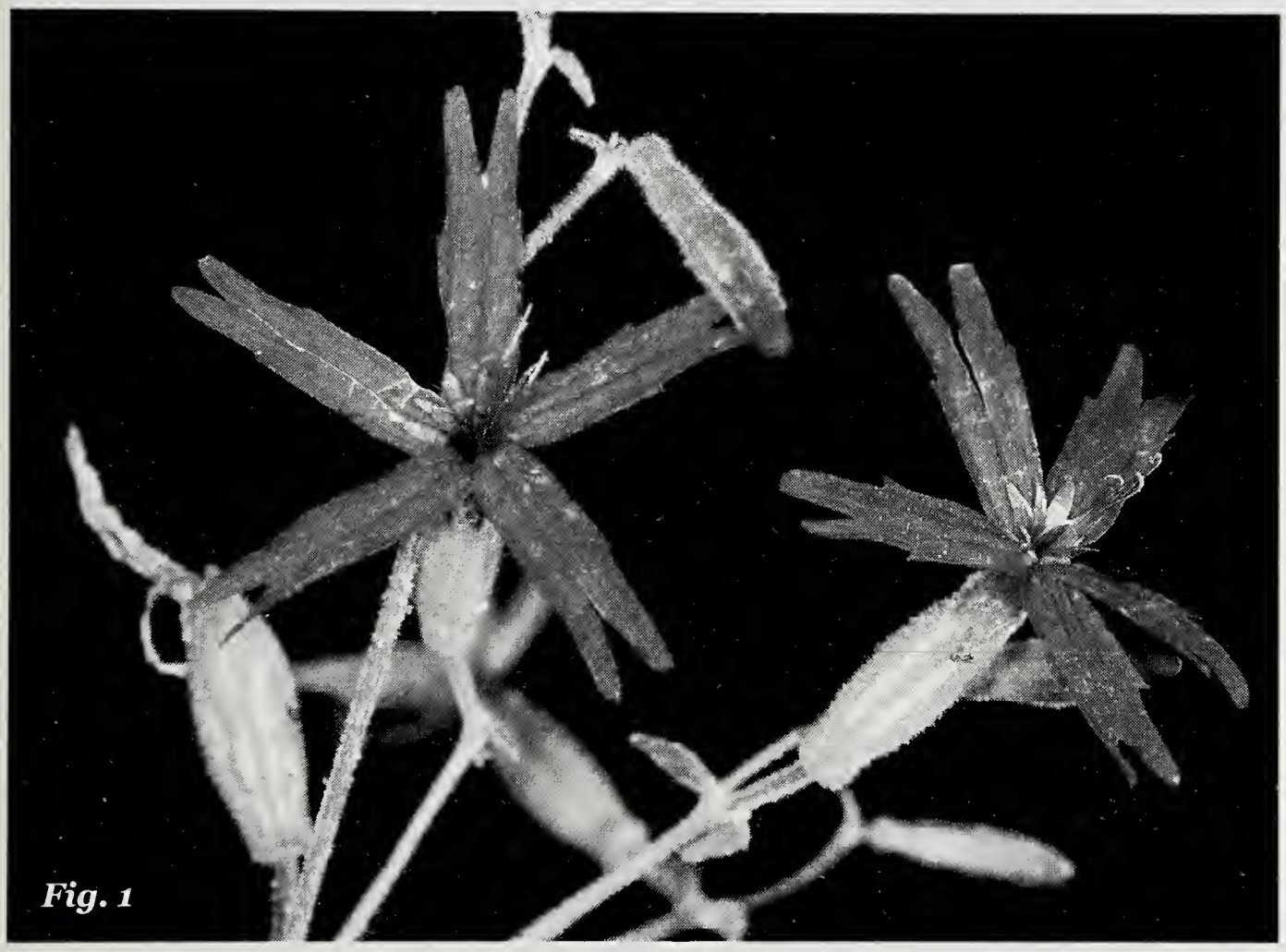

Fig. 1

It is a plant that attracts visually, especially when it grows to at least one foot high and rarely two, with flowers that are one and possibly two inches in diameter. Fire pink sometimes forms colorful stands with blue phlox, wild geranium, foamflower and celandine poppy.

The vivid red not only attracts the explorer, but also the hummingbird with its long beak and the butterfly with its extended proboscis. They can easily reach into the flower's long narrow corolla tube, pollinating the plant while enjoying the sweet rewards. Bees try to chew holes through the corolla tube and attempt to rob some of the nectar. Success is not always theirs.

All parts of the plant—stem, leaves, and flower tubes—have tiny hairs which are coated with a spittle-like sticky secretion. This arrangement keeps crawling insects and also small flying creatures from reaching the flower (thus the common name catchfly) and assures cross-pollination by hummingbirds and butterflies.

A short time after blooming, the flower produces green capsules which are sticky to the touch. They mature rapidly, swelling in one to two weeks with numerous brown seeds. The capsules burst, curl back and hang down, spilling the mature seeds to the ground. After germinating and growing in a favorable area, fire pink blooms in the second year with longer lasting flowers, although the plant is a short-lived perennial.

Indian Pink
Worm Grass, Pink Root, Star Bloom
Spigelia marilandica


Fig. 2

Indian pink (*Spigelia marilandica*) is known by many common names and the name depends upon the appearance of the plant and how it may be used. The sharply cut lobes of the flower may remind one of the serrated edge of material cut by pinking shears. Native Americans used the plant medicinally and taught the colonists that the root of the plant could be utilized in small doses to expel intestinal worms. During this period in time the plants were collected and shipped in bales to Europe for pharmaceutical processing and purification. Indian Pink was on its way to extinction.

Spigelia marilandica is a perennial plant 15-20 inches in height. It grows in mesic soil in open hardwood forests and along edges of wood openings. In the Great Smokies, it occurs only in limestone soils around the edges of the park where it blooms from April into June.

As one comes upon a clump of four to seven pairs of green leaves and is struck by the red and bright yellow of the one and a half inch flower, he is visually set back by its beauty. The appearance of the sharp outline of the flower and the color contrast between the deep red to scarlet of the tubular corolla and the five bursting starlike yellow lobes, with the waiting stigma in prime position is truly a sight to see and to photograph, especially close-up (Figure 2).

The green two-lobed fruit holds a few blackish-brown angled seeds which ripen about a month after the flower fades. They catapult out as the fruit ripens.

The genus name honors Adriaan van der Spieghel (1578-1625) a Flemish botanist and anatomist. His Latinized name is Spigelius.

Shoals Spider Lily, Cahaba Lily
Hymenocallis coronaria

Spider lily (*Hymenocallis*) is a tropical and exotic looking plant, and is strangely beautiful. It is a true native of the Southeast,


Fig. 3

but is somewhat difficult to identify as to species. Blooming from late spring into summer in swamps, stream banks, shoals, marshes and other wet areas, it is a perennial which may reach three feet in height with the most pure white six inch flowers (Figure 3).

The shoals spider lily, also known as the Cahaba lily, may have one to three stalks with two to seven white flowers on each leafless stalk. Each flower has three petals and three petallike sepals which are long and strap-like and join at the base forming a long greenish floral tube. The six pollen bearing anthers are very evident while the lower half of the stamen filaments unite to connect with a central flaring concave-shaped tissue or crown which gives the plant a spidery appearance. The strap-shaped leaves emerge near the base of the plant and can be up to 30 inches in length. All these parts normally stand out of the water.

The shoals spider lily is found only in fast flowing streams and rivers that have rocky beds so that the roots of the plant which arise from a large bulb are anchored in the cracks of the exposed bedrock. The leaves and stems of this plant are more sturdy than other species, therefore overcoming the pressure of the running waters. Waterwillow (*Justicia americana*) is a much smaller neighbor of the spider lily and can also be found amongst the rocks.

The flowers of *Hymenocallis coronaria* open in the late afternoon and night, emitting a pleasant fragrance into the next day, withering in the evening. Usually only one flower on a plant opens each day, but this depends upon the light intensity and the condition of the plant. During this time, when blooming reaches its peak in late May, hawk moths are busy as the chief pollinators of this rare Georgia state endangered species.

The plants fruit from July to August, and are found mostly near the fall line in Alabama, South Carolina, and eight counties in Georgia. Their stands have been reduced significantly by damming and polluting and other waterway activities by man. Enforcement of laws pertaining to land use and water quality plus public education are needed in order to protect the remaining stands of this showy plant for posterity.

Grass of Parnassus

Parnassia asarifolia
P. grandifolia
P. caroliniana

Grass of Parnassus (*Parnassia*) is an herbaceous, native perennial plant that can reach 8 to 12 inches in height. The basal leaves have veins without branches; they arch in parallel fashion from the base of the leaf to the

Fig. 4

apex. The flower is bisexual and insect pollinated with the male parts developing and declining before the female parts mature (protandry).

Grass of Parnassus is very distinctive in appearance and cannot be mistaken for any other plant due to its very unusual, attractive flower (Figure 4). The petals are white with green translucent lines which can be parallel or branched, depending upon the species. These green lines, which reflect some ultraviolet light, are like neon lights to pollinators and act as nectar guides.

Also seen in the flowers of the various species are the different sizes and shapes of the true and false (staminoids) stamens. In the species *Parnassia asarifolia*, the false stamens are shorter than the real ones, however, in *P. grandifolia*, which is somewhat rare, the false stamens are longer and pointed. Also rare, is *P. caroliniana*, which has longer rounded false stamens. The false stamens have swollen glands that glisten like drops of nectar, but are dry. They entice the flying insects to enter the flower where they find that the active nectaries lie near the base of the filament.

The differences in color and design add much to the mystery and delicate beauty of the flower and make this favorite plant a challenge to photograph.

Grass of Parnassus is not a grass and in no way does it resemble a grass, despite its common name. Parnassus is a mountain in central Greece and these plants do not grow there. A similar plant that may have resembled grass was named by the first century Greek naturalist, Dioscorides. That plant may have been *Parnassus palustris*, a species with thinner leaves.

Photographing Wildflowers

Photographing wildflowers is both a joy and a challenge. Locating these plants and hiking to these areas are part of the enjoyment. To fully appreciate the end product, whether it would be in a publication or a slide presentation, a serious list of equipment is needed.

A 35mm or digital camera with three or four different macro focal length lenses (24mm, 60mm, 105mm, 200mm) for obtaining various perspectives and working distances from the subject is useful if not essential.

Another important piece of equipment is a sturdy tripod which is capable of being used at the lowest ground level possible so that images can be made at the plants' height.

Reflecting or diffusing devices are necessary to change or increase/decrease light intensity and quality. A separate dedicated flash unit would be a useful accessory to supplement the existing light or to act as the main light source when needed.

Of the utmost importance is positioning the camera for the correct angle and format. Of equal importance is the positioning of the subject in the image field so that all important features are on or near the same plane in order to utilize to the fullest the narrow field of focus which is always present in close-up photography.

Clearing the image area of unneeded debris without destroying the environmental picture is the last step before releasing the shutter. Have fun photographing!

BotSoccers enjoying the shoals spider lilies on Flat Shoals Creek
on Steve Johnson's property in Harris County, May 20, 2000

The BotSoc has had a special relationship with the shoals spider lilies on Flat Shoals Creek for some time, and if the weather cooperates a large crowd can be expected every time we field trip there.

The owner of the property, Steve Johnson, became a BotSoccer almost in self defense as he once learned that this august group was holding a field trip to see the spider lilies on his property without his permission! He joined the field trip and gently informed them of their trespass and then joined the society.

Since that inauspicious start, he's hosted many wonderful trips and even a Holiday Party at his cabin. Many other conservation-oriented groups also field trip there. If you'd like to see the lilies on your own, a call to Steve would be appreciated. He keeps an odd assortment of old shoes and walking sticks for visitors to the shoals who come unprepared to wade, on the river bank right by the best lilies!

The plant photographs are by Fred Mileshko including the spider lily on the back cover and the Indian pik on the front cover. The photograph on this page and page 2 are by Scott Ranger.

Montane Longleaf Pinelands...

Little-known and Disappearing Treasures

Johnny P. Stowe, Jr.

J. Morgan Varner, III

John P. McGuire

Introduction

Scattered throughout the rough and rocky ridges of northwest Georgia and northeast Alabama remain isolated patches of montane longleaf pine (*Pinus palustris*), the vestiges of a spectacular, but largely unrecognized, fire-adapted ecosystem. Longleaf is the keystone canopy species in some of the most species-rich plant communities outside the Tropics, and the decline of many species of flora and fauna has tracked the decline of longleaf. Associated primarily with the sandy coastal plain and fall line-sandhills, longleaf also grows in the

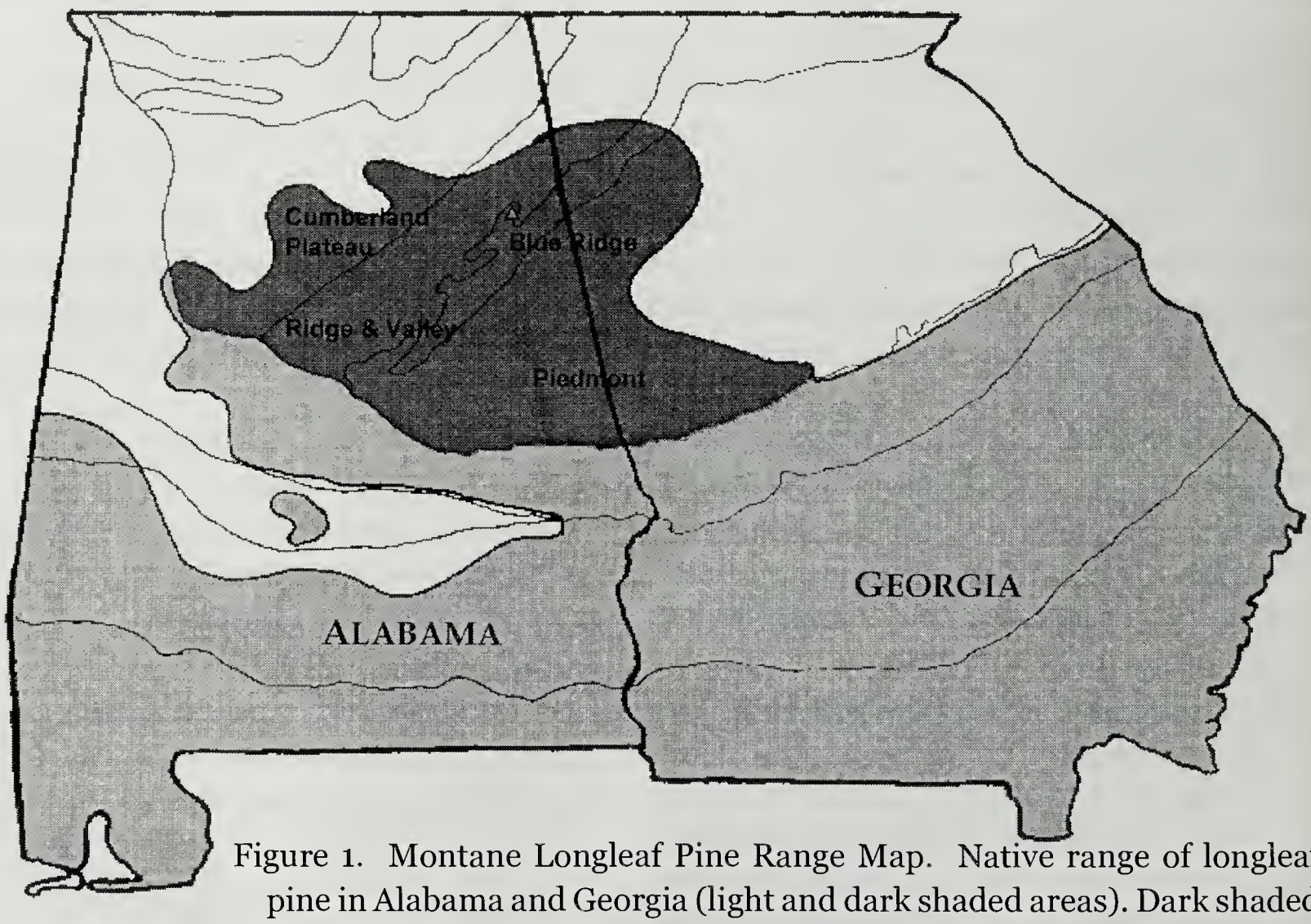

Figure 1. Montane Longleaf Pine Range Map. Native range of longleaf pine in Alabama and Georgia (light and dark shaded areas). Dark shaded region denotes the range of montane longleaf pinelands. This region contains remnants of a once-widespread fire-adapted ecosystem.

Piedmont, Ridge and Valley, Cumberland Plateau and Appalachian physiographic provinces. We seek here to illuminate montane longleaf ecosystems, defined as longleaf growing in the provinces listed above, unique from coastal plain and fall line-sandhills (Figure 1), and to highlight current protection efforts. We also make a plea for increased public education, prescribed fire, restoration, and protection of the dwindling montane longleaf ecosystem.

Figure 2 . Bolting, which shows the rocky nature of much of the montane pinelands. Longleaf pine seedling in the "bolt" or "rocket" growth stage. Following seed germination, longleaf pine concentrates its growth in a large below-ground taproot, waiting as long as a decade or more to "bolt" to the canopy. Since fire-exposed soil is required for seed germination, most remnant pinelands lack sufficient seedlings. Photo from Caffey Hill, Fort McClellan, AL (1500' elevation).

Once dominating about 90 million acres of the Southern landscape, longleaf pinelands have experienced a 98% decline since settlement. Over the last few centuries, exclusion of fire, heavy timbering, exploitation by the naval stores industry, and free-ranging livestock combined to decimate this once magnificent forest. The decline of montane longleaf began in the 1830's when settlers invaded northwestern Georgia (the last stronghold of the Cherokee Nation) and removed the Native Americans, who were already decimated by European and African diseases. The advent of the railroad into the area in the late 1800's accelerated this trend. Over exploitation to support the area's numerous iron-ore mines and other "developments"—and the resulting unnatural buildup of logging slash—set the stage for stand-clearing conflagrations ignited by steam locomotives and settlers. Since that time, montane longleaf has dwindled away, and today is usually found only in the most inaccessible ridges.

The Montane Pineland Landscape

Montane longleaf is adapted to dense, rocky soils (Figures 2, 3); steep, exposed slopes; eastern, southern and western aspects; and high elevations (up to 1,900 feet above sea level, Figures 3, 4). It produces more frequent and heavier cone crops than other longleaf populations, and is also likely more ice-tolerant.

Longleaf once grew in much of northwest Georgia and northeast Alabama (Figure 1). Reed (1905) reported that longleaf dominated 87 percent of the landscape in Coosa County, Alabama, and was a codominant canopy species on the remaining "creek land." He measured longleaf pines 110 feet tall that were more than 40 inches in diameter, and more than 300 years old. Harper (1905) and Andrews (1917) described a vast open longleaf forest among the

Figure 3. Choccolocco, which shows the mountainous terrain. Montane longleaf pine ecosystems occur in a rugged landscape, in stark contrast to the usual sandhills of the coastal plain. Stands occur up to 1900 feet elevation and can be found on all aspects, south-facing being the most common. Photo of Choccolocco Mountain, Fort McClellan, Alabama (1900 feet elevation).

mountains of northwest Georgia. Coauthor Stowe's great-grandfather, J. Sterling Young (1849-1955; unpublished memoirs), alluded to the open, fire-maintained nature of the longleaf pine and farm landscape in the Cedar Valley (Ridge and Valley) of northwest Georgia in the late 1800's (specifically, in Young's Valley, in southcentral Polk County), when he wrote

> *Partridges were plentiful and there would be generally from thirty to forty in one covey. When flushed, they flew a hundred or a hundred and fifty yards and could then be waled up and bagged with a muzzle loaded gun.*

Partridges, (otherwise known as bobwhite quail, *Colinus virginianus*) are naturally abundant only in open, frequently burned pinelands.

Montane Longleaf Flora and Fauna

The integrity (as gauged by "natural" processes, species composition and structure) of the remnant montane longleaf stands has been dramatically marred. Fire suppression has allowed many montane longleaf stands to be invaded by Virginia (*P. virginiana*) and shortleaf (*P. echinata*) pines, black gum (*Nyssa sylvatica*) and chestnut (*Quercus montana*) and scarlet oaks (*Q. coccinea*). Many thousands of acres have been converted to loblolly pine (*P. taeda*) plantations.

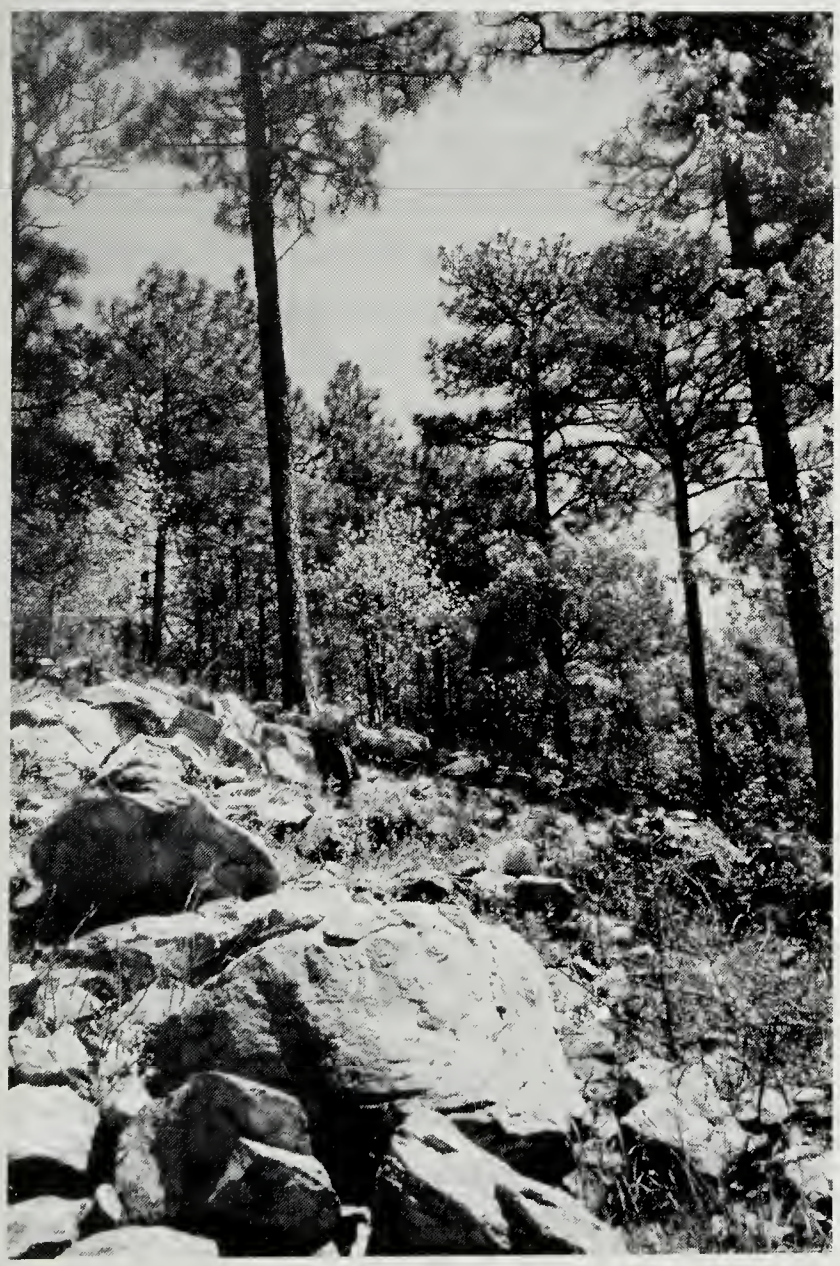

Figure 4 a,b,c. Caffey Hill, which shows the steep terrain, plus the diverse flora of a frequently-burned longleaf ecosystem. Groundcover species-richness in pinelands is among the highest found anywhere on the planet, and montane pinelands are no exception. Fall-blooming asters dominate the groundcover, as do legumes and grasses (especially bluestems). The major difference between montane pinelands and their coastal plain cousins is the steep and rocky terrain.

Montane longleaf pine plant associates range from species typical of fall line-sandhills communities such as turkey oak (*Q. laevis*), blackjack oak (*Q. marilandica*), sensitive briar (*Mimosa microphylla*), yellow foxglove (*Aureolaria pedicularia* var. *pectinata*), prickly

pear (*Opuntia humifusa*) and poison oak (*Toxicodendron pubescens*) to species more typical of Appalachian regions, such as Virginia pine, scarlet and chestnut oaks, mountain blueberry (*Vaccinium pallidum*), and mountain laurel (*Kalmia latifolia*). In the late 1990's, coauthor Stowe found longleaf growing 20 feet from American chestnut (*Castanea dentata*) on Indian Mountain, Alabama, near the Alabama-Georgia boundary. Frequently burned ground covers consist of grasses (wiregrass of the coastal plain being replaced by the broomstraws—(*Andropogon furcatus*, *A. ternarius*, *A. virginicus*, and *Schizachyrium scoparium*), along with goat's rue (*Tephrosia virginiana*), and bracken fern (*Pteridium aquilinum*), interspersed with a few rushes and sedges (such as *Scleria triglomerata* and *Cyperus retrofractus*). The flora of much of this country is undocumented because of the rugged topography and the outlaws inhabiting it. Lying along the state line, it has been a haven of lawlessness (such as moonshiners and marijuana growers) since early settlement; it is safer now, but few scientists or naturalists know the area well. Ironically, arsonists have unwittingly helped maintain montane longleaf, by frequently setting woods fires.

Vertebrates associated with montane longleaf include the federally endangered red-cockaded woodpecker (*Picoides borealis*), and the fox squirrel (*Sciurus niger*). While fox squirrels found in coastal plain and fall line-sandhills longleaf range from silver to black, those found in montane longleaf are usually reddish, often with black or white heads indicative of interbreeding among the three species that overlap in the Georgia-Alabama-Tennessee area. A breeding bird study in several forest types in the Talladega Mountains of Alabama found the greatest avian diversity and abundance in montane longleaf sites (Hill 1998).

Fire: Longleaf Pine's Best Friend

Fire is requisite for longleaf ecosystems. The southeastern United States has more lightning strikes than any other area in North America, and fires sparked by lightning once played a major role in maintaining longleaf ecosystems. Most lightning activity is in late spring and summer, but rain often extinguishes fires started by lightning. Native Americans, who arrived in the Southeast at the end of the last glaciation, no doubt played a paramount role in helping longleaf establish itself in the region through their common practice of "prescribed" burning. The Southeast was the most culturally advanced and populated part of presettlement North America; and this may help explain the presence of montane longleaf around the Coosa and Etowah region.

Longleaf's fire adaptations include its: need for bare mineral soil on which to establish; grass stage, during which a thick tap root is sent deep while the stemless bud is protected by a sheath of needles; bolting stage, during which the tree rockets its bud out of the grass stage high out of reach of fire; rapid pruning to prevent fire from climbing to the terminal bud; thick bark, which protects the sugar transporting inner bark; and long needles, which carry fire when cast. In the absence of fire, longleaf and its herbaceous associates are out-competed by other species.

Today's Montane Longleaf Pinelands

Montane coniferous forests in the Appalachians are among the most threatened ecosystems in the United States (Christensen *et al* 1996), and montane longleaf pine forests may well be the most threatened of all. Certainly, among longleaf ecosystems, the

Figure 5. Caffey Hill, illustrating longleaf pine with fire-charred trunks.

montane type is the most imperiled; it comprises only about two percent of longleaf's total decimated remnant acreage. Only two sites (Fort McClellan and the Talladega National Forest in Alabama) contain large, relatively intact, natural montane longleaf tracts.

Montane longleaf is largely unknown and unrecognized. The 1995 National Biological Survey's list of endangered ecosystems included longleaf, but only coastal plain populations. A 1996 USDA Forest Service inventory of longleaf pinelands denoted an "Alabama Mountains" population, but not what is likely the state's most northernmost longleaf, that of Cherokee County. Moreover, the inventory did not include Georgia's montane longleaf stands, because they were not large enough to show up in the sampling design (Ken Otcalt, USFS, personal communication). The Nature Conservancy's exhaustive Terrestrial Vegetation of the United States contains 85 different longleaf ecotypes, including montane longleaf, but it erroneously omits or is unsure of Georgia's montane longleaf in certain categories. On a bright note, the Longleaf Alliance is spreading the word about montane longleaf among a diverse array of conservationists, natural resource managers, and landowners.

While Alabama's montane longleaf has been well documented, study of Georgia's montane longleaf pinelands has been neglected. Georgia montane longleaf is found on Pine Mountain in Talbot, Meriwether, Harris and Troup counties, with notable stands found near Sprewell Bluff State Park along the Flint River, at F.D. Roosevelt State Park, and at Callaway Gardens. The Sprewell Bluff longleaf is especially striking. Farther north, in Polk, Haralson and Paulding counties along the Cartersville Fault (an extension of the Appalachians that delineates the Piedmont from the Ridge and Valley), fire-suppressed longleaf is scattered along the spines of ridges,

either singly or in groups of a few mature trees.

Wharton (1998), citing earlier authors, noted the heavy longleaf pine forests of the Coosa flatwoods of Cherokee and Etowah counties in Alabama and Floyd County, Georgia, "where such coastal plain environments as pitcher plant bogs were present, as well as annual fires." These flatwoods for the most part have been inundated by Lake Weiss or converted to loblolly pine plantations. Greear (1986) described disjunct coastal plain plants on Cassville Mountain (in the Ridge and Valley near the Cartersville Fault) in his paper on sag ponds in the first issue of *Tipularia* in 1986.

The northernmost documented montane longleaf grows in Georgia's Chattooga and Floyd counties, on the Chattahoochee National Forest and Berry College, respectively. A 1998 study on Berry's Lavender Mountain lamented both the fire suppression and concomitant hardwood encroachment and lack of longleaf regeneration—plus the hyperabundant white tailed deer (*Odocoileus virginianus*) population, which had decimated the herbaceous layer—and warned that this special longleaf forest was in danger of disappearing. Recently, however, Lavender's longleaf has received attention from the College's students, faculty and staff, who have formed a longleaf management advisory committee. Hopefully, prescribed burns, plantings, drastic reductions in the deer herd aimed at restoring the herbaceous groundcover via controlled hunting, and other "on-the-ground" restoration activities will soon be implemented.

The Pinhoti Trail transects some of the most spectacular montane longleaf country in Alabama. In Cleburne County, near Terrapin Creek, the trail runs along Oakie Mountain. In spring, one can stand among old growth longleaf and look east across a deep hollow at a mountainside of blooming mountain laurel. In Cherokee County, the Pinhoti runs along Indian Mountain, passing Flagpole Mountain (Indian's peak). At spots along the trail, ancient longleaf, some twisted by ice and wind, provide a glimpse into the past. And "lighter" stumps, the resin-soaked heartwood of dead longleaf, show more than 200 annual rings. In the covers and hollows between the ridges, trilliums (*Trillium* spp.), wild ginger (*Hexastylis* spp.) and other species abound.

Conservation Needs

To retain our now rare montane longleaf pinelands, we encourage conservationists to act, by calling for public education, prescribed fire, restoration and land protection (fee simple purchase as well as conservation easement and tax incentives to keep land wild).

In Georgia, the Cartersville Fault—where the watersheds for Cedar Creek, Terrapin Creek and the Tallapoosa River meet—is known from west to east as Treat, Casey, Dugtown, Hightower, Everett, Paris, Vinson and Braswell mountains. The fault provides a last chance to protect large tracts of Georgia's montane longleaf land that could be restored to presettlement conditions. The substrate is there, and so are remnants of the ecological communities. Much of the land is still in large tracts, many of them owned by timber companies. But as Atlanta metastasizes toward the region, opportunities for protecting large tracts of land are disappearing. Land that recently sold for $300 per acre now sells for thousands of dollars per acre, as urbanites seek to escape the city by commuting to work or building retirement or second homes. Atlanta is seeking water from the montane longleaf region, and there are plans to divert water and build reservoirs that would flood irreplaceable land. Unless action is taken soon, the montane longleaf pineland of northwest Georgia will soon be isolated, postage stamp sized parcels of land that can never again be fully natural.

The ability of natural area managers to set fires in our remaining woods may dictate our capacity to conserve and restore montane pinelands. Atlanta's air pollution woes threaten prescribed burning in northwest Georgia, as Birmingham and Anniston do in Alabama.

Education is needed at several levels. Our schoolchildren learn about species losses in Brazil's rainforest, while the biodiversity of the former longleaf fire forest plummets in their backyards. Respected conservation groups actually fight longleaf restoration, ignorantly lumping removal of off-site hardwoods in fire suppressed forests as part of restoring longleaf ecosystems, together with conversion of natural hardwood forest to loblolly pine biodeserts.

Alabama's Talladega National Forest protects montane longleaf ecosystems. Georgia should act with alacrity to follow suit. Aldo Leopold (1933) questioned the notion of progress and "the good life," and asked, "Are we too poor in purse or spirit to [keep] some of the land pleasant to see, and good to live in?" Indeed, if northwest Georgia's montane longleaf pinelands are lost to so-called "development," our society will have left a deplorable signature on the land that can never be erased.

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The Vascular Flora of the Chattahoochee River National Recreation Area, Georgia

Karin Heiman

The vascular flora of Chattahoochee River National Recreation Area in north-central Georgia, USA, was inventoried. A total of 823 taxa of vascular plants, in 433 genera, were identified. Special notation of rare and uncommon species, as well as invasive exotics, was made. Collections were made and an herbarium and data base were established. Numerous unusual natural communities were also observed and are discussed. A report including management recommendations was written (Heiman, 2000). This paper is composed of excerpts from this work.

Introduction

The Chattahoochee River National Recreation Area (CRNRA) occurs along the Chattahoochee River in north central Georgia (see Figures 1-3). The CRNRA is not one contiguous park. It consists of 16 units, in four counties, scattered along 48 miles of river corridor, from Lake Lanier south to Atlanta, Georgia (see Table I). The mission statement for the park reads thusly: "The purpose of the Chattahoochee River National Recreation Area is to lead the preservation and protection of the 48 mile Chattahoochee River corridor from Buford Dam to Peachtree Creek, and its associated natural and cultural resources, for the benefit and enjoyment of the people."

The Chattahoochee River currently provides approximately 70% of the water supply for Atlanta and supplies substantial electricity to the region (Atlanta Regional Commission, 1992). Most salient to this study, the river corridor serves as one of the few wild green spaces in an ever burgeoning metropolitan area. The park is used for walking, hiking, canoeing, rowing, kayaking, tubing, fitness activities, jogging, horseback riding, bicycling, fishing, birdwatching, sunbathing, nature interpretation, picnicking, family reunions, and just to "get away from it all."

The purpose of this study was to:

·Survey and document the vascular flora of designated park units within Chattahoochee River National Recreation Area;

·Establish an herbarium of vascular plant specimens for staff, researchers, and the public;

·Develop a data base of information on the park's flora to better detect future changes in the ecological systems, enhance scientific study and environmental education, identify

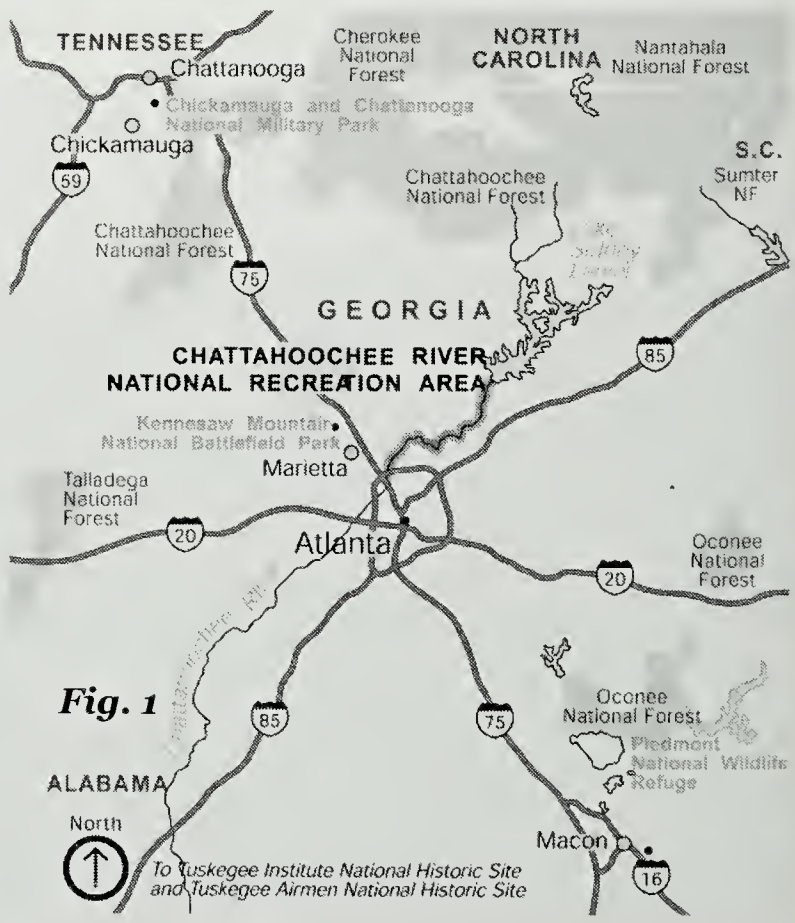

Fig. 1

monitoring needs, and strengthen current and future management of the park.

Methodology

At the onset and throughout the project, existing information was gathered from numerous sources and some very knowledgeable individuals. Visits to the Georgia Natural Heritage Program (GNHP) were made to examine records and gain information. Discussions and field trips with Steve Bowling and Jerry Hightower also provided significant information.

To collect specimens and develop the species list, all units were covered on foot as thoroughly as practicable. Two canoe trips were made to provide better access to examine some of the units. Since flowering times for different species vary so widely, visits to each unit occurred during as many times of the growing season as possible. Visits were made over a course of two years, with 94 unit visits carried out on 39 different days.

Information recorded for all species included common and scientific names, synonyms, abundance, phenology, presence in each unit, collector, collection dates, locations, exotic status, and rarity. Abundance was defined by four categories: Abundant (found in most of the units, often in large populations), Common (found in many of the units; or in a few units, but with large populations), Uncommon (found in only a few units, often in smaller populations), and Rare (found in only one or two of the units, populations may be quite small). Specimens were pressed, mounted, and organized by genus in a steel cabinet housed at the National Park Service's (NPS) Island Ford Administration Office.

Specimens were identified using a large combination of authorities listed in the Literature section, especially utilizing the *Manual of the Vascular Flora of the Carolinas* (Radford, Ahles and Bell, 1981) and a working draft of the *Flora of the Carolinas and Virginia* (Weakley, 1997). Scientific nomenclature follows Kartesz (1994). Ecological communities information was partially based on Schafale and Weakley (1990) and Schafale (1998).

Specimens were pressed, dried, identified, and labeled. Duplicates of some species were collected, especially in cases where there was substantial morphological variation or where specimens of both fruit and flowers could be collected.

Results and Discussion

Summary

A total of 823 taxa of vascular plants, in 433 genera, were collected and identified (for more detailed information, please contact the park's administrative office at the following address: National Park Service, 1978 Island Ford Parkway, Atlanta, GA 30350-3400; Telephone 770-399-8070; Website: www.nps.gov/chat). Of these, a number were rare or uncommon for the area. Considering the urban nature of the park the large percentage of exotic species (22%) seems predictable. A data base was established which contains a checklist of species for all park units, with information on common and scientific names, phenology, rarity, whether native or exotic, locations, habitats, collection dates, collectors, and other notes. A report was generated that describes the flora, natural communities, features of each park unit, and management considerations. Since all the units could not be visited regularly throughout the growing season, it is presumed that additional species may be found. The steel herbarium cabinet containing the study's specimens is housed in the park's administrative building at Island Ford. It is the author's hope that the herbarium

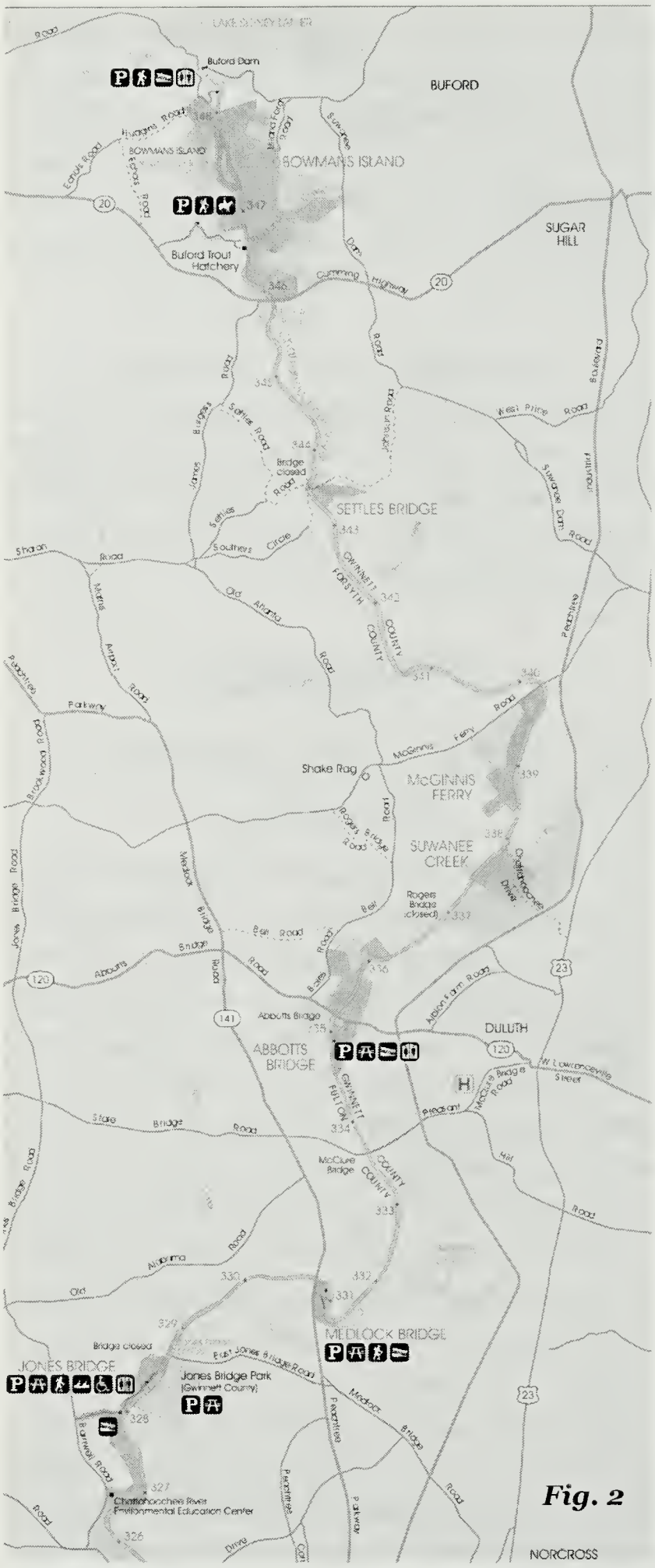

Fig. 2

will be used by interested individuals both for identification and for additions to the flora.

The sections below will discuss general site conditions, past studies, park units, and community types, as well as rare, uncommon, and exotic species. For the purposes of this study, natural communities were grouped into five ecological community types (Mixed Alluvial Forest, Upland Hardwood Forest, Wetland, Piedmont Cliff, and Right-of-Way).

Site Description

The river corridor is said to have been formed about 400 million years ago. The majority of the corridor is underlain by metamorphic rock composed of quartz, feldspar, mica, and other minerals. Alluvial soils are often very high in nutrient content, providing a specific habitat for species associated with these conditions. The river corridor ranges from flat floodplain to steep, shaded slopes, to the sheer Palisades cliffs rising up to 50 feet above the river.

The river corridor provides unusual habitat for the Piedmont of the southern U.S. The natural communities are very similar to those in the Appalachian Mountains. This is likely due to the shady, protected steep slopes and the cooling effects of the adjacent water, and to the riparian corridor connection to the mountains. Cliff habitats and numerous wetlands add to the interesting ecological diversity. One reason for the relatively high diversity is the mixing of different species' ranges in this region. The flora of the park is composed of a mixture of species associated with the Coastal Plain, Midwest, Piedmont, and Appalachians.

Due to the release of dam water from the bottom of Lake Lanier, the river temperatures are extremely cool. This provides the southernmost habitat for trout. Twenty-two other species of game fish are present (NPS, n.d.).

The threats to the flora of the park are significant, both in the past and present and especially in the future. These include introduction of pests and diseases, weedy invasive species competition, air pollution, water pollution, erosion, sedimentation, visitor impacts, botanical and medicinal collecting,

increased pressure from deer populations, and changes caused by surrounding development (hydrology, microclimate, temperature, humidity, light, sound, and reduction of pollinators).

Past Studies

Various botanical studies have been initiated sporadically within and around the park. Complete copies are generally difficult to find and most studies only cover a few units. No single comprehensive study has been done for the entire park.

In 1982, Lloyd Snyder, Jr., working as a resource management volunteer for the Volunteers-In-Parks Program, created two checklists for the park's Natural Resource Base Inventory. One was specifically focused on ferns while the other covered vascular plants in general. The fern list is fairly complete, with 23 species, but the vascular list includes only 61 species.

David R. Ettman, staff botanist for the Archeological Survey of Cobb-Fulton Counties, conducted a botanical survey of the Palisades area in Fulton County. He found a total of 281 plant species. Although there is no date on the study, it appears to have been done prior to 1977, which is before the park was established. It is difficult to discern the size of the survey area he utilized. Ettman mentions a report by R. Lee, issued by the archeological survey in 1976, in which a large area along the west side of the river in Cobb County was surveyed and 497 plant species were found. The report discusses historic human use of plants. It is difficult to tell how much of this study occurred on park land.

A floral and faunal survey for the Chattahoochee River re-regulation dam project (Troxel and Haynes, 1985) was conducted by the U.S. Fish and Wildlife Service in 1985. Covering a portion of the park land, it records

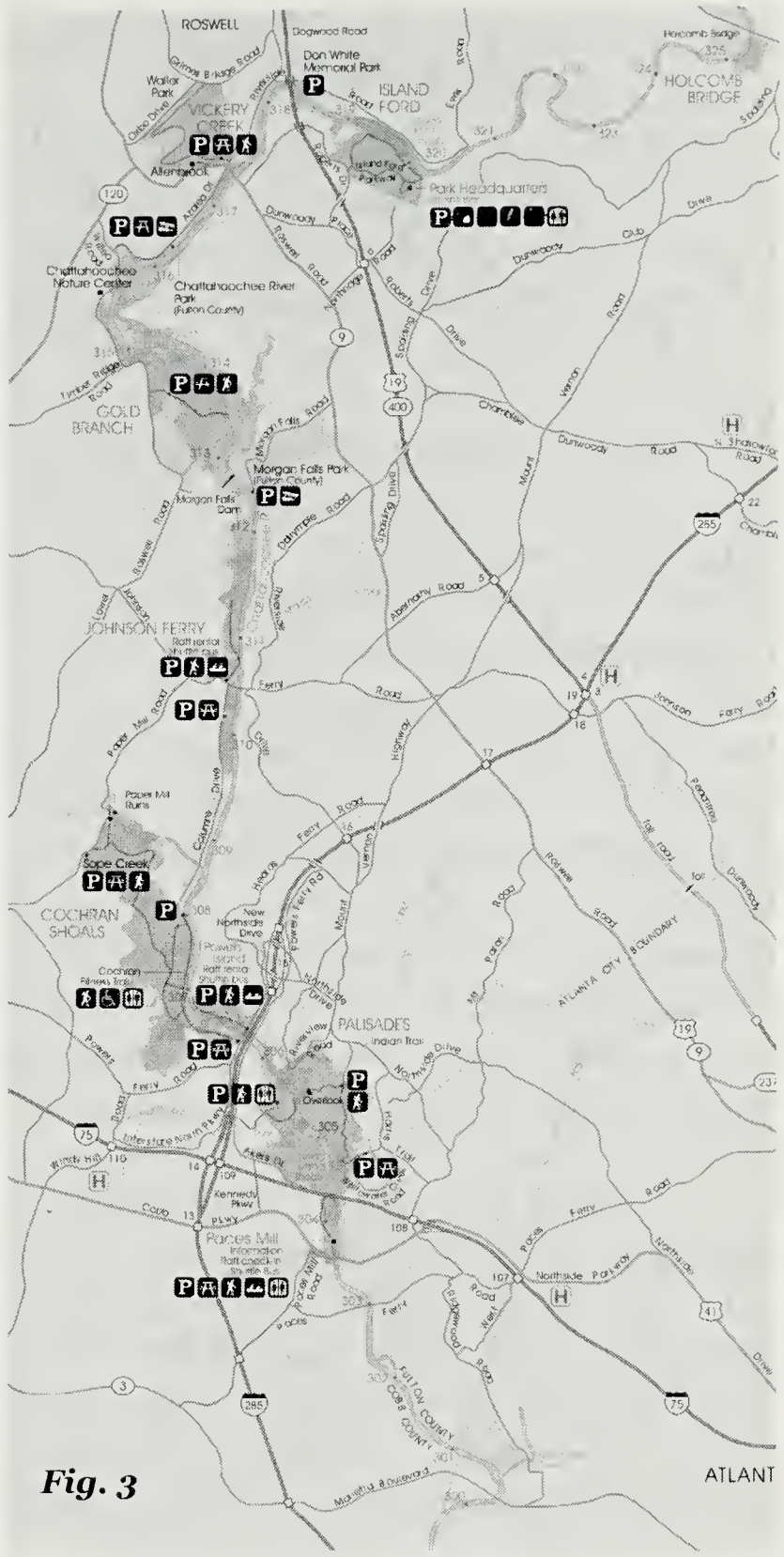

Fig. 3

227 vascular species not including those species "not confirmed...but with high probability of occurrence" (130 herbaceous plants, 22 vines, 30 shrubs, and 45 trees).

The most recent study, by Garrow and Associates, 1996, was a "Biological Inventory for the Proposed Chattahoochee River Nature Park Project," for Fulton County and the City of Atlanta. It basically discusses natural communities and dominant plant species for each.

Park Units

Each park unit has its own unique characteristics (see Table I). A number of the 16 units are dissected by a large road, river, or other significant feature. In the past (including the time period of this study), each side was considered a separate unit, creating a total of 21. While community types are generally the same for all units, each offers different topography, geologic attributes, rare species, wetlands and land areas. The Palisades and Cochran Shoals units are well known for their biotic features (Ettman, n.d.; Garrow, 1996; Lee, 1976). Several of the lesser known units were found to encompass significant features. These included Gold Branch (rich soils, wetlands, uplands, diverse and unusual species), Johnson South (the wetland ditch between the parking area and the road added many wetland species to the list), and Suwanee (extensive wetlands).

The number of species recorded varied among units. This would be expected, since the units differ in size, topography and historic land uses. The units with the most species were: Island Ford (with 293 species), Cochran Shoals (286), Gold Branch (282), Palisades West (246), and Palisades East (231). Those with the fewest species include Powers Island and Medlock (81 each), McGinnis Ferry (75), Holcombe and Abbott North (72 each).

TABLE I
Park Units of the Chattahoochee River National Recreation Area

Park Unit	Mile Mk	#Spp.
Paces Mill	304	148
Palisades East	305	246
Palisades West	305	231
Powers Island	306.5	81
Cochran Shoals	307-308	286
Sope Creek	308	99
Johnson Ferry South	310	93
Johnson Ferry North	311	113
Gold Branch	313-314	282
Vickery Creek	317	108
Island Ford	319-320	293
Holcomb Bridge	325	72
Barnwell	327-328	101
Jones Bridge	328-329	82
Medlock Branch	331	81
Abbotts Bridge South	335	89
Abbotts Bridge North	336	72
Suwanee Creek	338	169
McGinnis Ferry	338.5-339.5	75
Bowmans Island West	346.5-348	136
Bowmans Island East	346.5-348	146

Ecological Communities

Natural communities have been studied in the region throughout the years (Schafale and Weakley, 1990). The most recent study relevant to the immediate park area is a 1996 report (Garrow and Associates) investigating the potential for a large nature park along the river. They describe ten ecological community types. These include: Levee Forest, Mixed Alluvial Forest, Box Elder Forest and Birch Forest, Maple-Sweetgum-Ash Forest and Cottonwood Forest, Alluvial Forested Wetland, Emergent/ Shrub-Scrub Wetland, Mesic Hardwood Forest, Pine Forest and Pine-Hardwood Forest, Right-of-Way, and Tree Farm.

For the purposes of this study the communities will be defined in a way that seems best for the herbarium collections. The community types will be listed as Mixed Alluvial Forest, Upland Hardwood Forest, Wetland, Piedmont Cliff, and Right-of-Way. All communities have been anthropogenically altered to varying degrees.

1) Mixed Alluvial Forest

The Mixed Alluvial Forest is probably the most common community type since the park follows the river corridor. These forests are subject to periodic flooding and generally remain moist throughout the year. Levee Forest communities, as well as Forested Wetlands with a full canopy, are included here because the areas are quite small and intermingled within the Alluvial communities. Alluvial communities can grade into all other community types. They may grade abruptly into Upland Hardwood and Cliff communities where steep slopes abut the alluvial floodplains. Wetland communities occur in the most water-saturated areas where the canopy is sparse or nonexistent.

The Alluvial Forests vary in their dominants, but are generally composed of combinations of the following trees: river birch (*Betula nigra*), box elder (*Acer negundo*), tulip poplar (*Liriodendron tulipifera*), sycamore (*Platanus occidentalis*), green ash (*Fraxinus pennsylvanica*), hackberry (*Celtis* spp.), red maple (*Acer rubrum*), sugar maple (both *Acer leucoderme* and *A. barbatum*), water oak (*Quercus nigra*), ironwood (*Carpinus caroliniana*), sweet gum (*Liquidambar styraciflua*), elm (usually *Ulmus americana*), and occasional beech (*Fagus grandifolia*). Loblolly pine (*Pinus taeda*), flowering dogwood (*Cornus florida*), hop-hornbeam (*Ostrya virginiana*), cottonwood (*Populus deltoides*), redbud (*Cercis canadensis*), are also found in some communities. The understory can be fairly open to quite dense, with thickets of greenbrier (*Smilax* spp.), privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), storax (*Styrax* spp.), dog hobble (*Leucothoe fontanesiana*), multiflora rose (*Rosa multiflora*), and poison ivy (*Toxicodendron radicans*). Pawpaw (*Asimina triloba*) can be quite prevalent, especially in the ecotone between this and the upland hardwood communities. Some of the many herbs include fish-on-a-string (*Chasmanthium latifolium*), wild rye (*Elymus virginicus*), wingstem (*Verbesina alternifolia*), and yellow coneflower (*Rudbeckia laciniata*).

In areas where flooding is less prevalent, these forests are similar to the Cove Forest type found in the Appalachian Mountains. Soils are moist but rarely saturated. Tulip poplar is often the dominant canopy species. Other trees may include red maple, hickory, walnut (*Juglans nigra*), basswood (*Tilia heterophylla*), black locust (*Robinia pseudoacacia*), ash, and sugar maple. Witch-hazel (*Hamamelis virginiana*) and Carolina rhododendron (*Rhododendron minus*) may occur in the understory here. This phase of the community type usually has the richest herbaceous flora of the forested types. This is especially true for the spring-blooming flora, which may include trilliums (*Trillium catesbaei, T. cuneatum*), spring beauty,

(*Claytonia virginica*), toothworts (*Cardamine heterophylla, C. dissecta*), bloodroot (*Sanguinaria canadensis*), hepatica (*Hepatica americana*), foamflower (*Tiarella cordifolia, T. wherryi*), and many others. Some of the ferns which may be found here include New York fern (*Thelypteris noveboracensis*), cinnamon fern (*Osmunda cinnamomea*), and Christmas fern (*Polystichum acrostichoides*).

2) Upland Hardwood Forest

This community type is composed of mixed hardwoods, generally dominated by oaks, occurring on well drained soils. Locations may include lands immediately above the floodplain if conditions are dry enough and slopes are steep or rocky. More frequently, this community occurs on upper slopes and gentle hilltops.

A number of community types are included in this heading. Mixed oaks include scarlet, black, red, Shumard, southern red, post, white, chestnut, and various hybrids (*Quercus coccinea, Q. velutina, Q. rubra, Q. shumardii, Q. falcata, Q. stellata, Q. alba, Q. montana*). Black gum (*Nyssa sylvatica*), sourwood (*Oxydendrum arboreum*), hickory (*Carya* spp.), magnolia (*Magnolia acuminata, M. tripetala, M. macrophylla*) and beech can be important components. In some locations, hickory is prevalent enough that the community would be classified as oak-hickory type. In more mesic locations, or those with richer soils, sugar maple, and tulip poplar may occur. At times, white oak is by far the dominant species. On xeric slopes, especially near cliffs, three different forest types may occur. One type is almost completely composed of chestnut oak (*Quercus montana*). Another is composed of the mixed oaks mentioned above with no strong dominants. The third type has pines mixed with hardwoods and could be classified as pine-oak heath, pine-hardwood, or other such types.

Pines include loblolly, shortleaf, or Virginia (*Pinus taeda, P. echinata, P. virginiana*). There are occasional, limited locations (within Bowmans and Island Ford) where pines are more dominant than hardwoods. For purposes of this herbarium study, these small areas were not separately designated. In two locations, pines are completely dominant due to creation of pine plantations. Much of the Abbotts North unit is covered by a plantation of loblolly pine with an average dbh of 14 inches. The McGinnis Ferry unit has a Christmas tree farm that has been left untended. Regionally uncharacteristic trees such as white pines and spruces are found here. At the time of this survey, there were no plans to alter the plantations.

The understory can vary greatly from being very open, with only leaf litter and a few herbs on the forest floor, to having dense shrub cover. Rosebay rhododendron (*Rhododendron maximum*) is quite uncommon, but Carolina rhododendron, blueberry (*Vaccinium arboreum, V. corymbosum*) and mountain laurel (*Kalmia latifolia*) are frequently found. Vines such as grape (*Vitis labrusca, Vitis rotundifolia*) and greenbrier may be common in both the Upland Hardwood and Alluvial Forest communities.

3) Wetland

The Wetland community type could actually be broken down into two phases, though most plant species would be shared between the two. The Floodplain Pool type occurs within Alluvial Forest communities in areas too saturated to produce a full canopy. Some standing water may be present all year, but generally very little. Herbaceous plants that can grow with low light levels, such as lizardtail (*Saururus cernuus*), arrow-arum (*Peltandra virginica*), and some sedges (possibly *Carex crinita*) are common. The Palisades, part of Gold Branch, as well as many of the other units, provide examples of this type.

The Semipermanent Impoundment type is characterized by greater standing water, and, hence, a more open canopy. Water levels are often maintained by beaver activity. Forbs, sedges, rushes and grasses predominate. Scattered shrubs and occasional stunted trees persist, such as elderberry (*Sambucus canadensis*), willow (*Salix nigra*), buttonbush (*Cephalanthus occidentalis*), shrub dogwood (*Cornus amomum*), alder (*Alnus serrulata*), red maple, and green ash.

Herbaceous plants include bur-reed (*Sparganium americanum*), sedges (*Carex crinita, C. intumescens*, numerous others), woolly mannagrass (*Scirpus cyperinus*), rush (*Juncus effusus*), rice cut-grass (*Leersia oryzoides*), marsh dewflower (*Murdannia keisak*), cattail (*Typha latifolia*), arrowhead (*Sagittaria latifolia*), jewelweed (*Impatiens capensis*), tearthumb (*Polygonum sagittatum*), bladderwort (*Utricularia* sp.), and seedbox (*Ludwigia alternifolia*). Occasionally aquatic weeds, such as parrotfeather (*Myriophyllum brasiliense*), become a problem. These communities are significant for the park's wildlife, especially beaver, wading birds, and amphibians. The best examples of these community types are at Suwanee, Cochran Shoals, and a small area of Gold Branch.

4) Piedmont Cliff

These communities cover a relatively small percentage of the park. Vickery Creek and the Palisades provide the most dramatic examples of this community. Small examples are found at Island Ford and a number of the other units where rock outcrops occur. Exposed rock structures provide a xeric habitat, which is ameliorated around the edges by shade from surrounding trees.

Vegetation generally covers a portion of the rock, if only the small cracks and portions of the top. Lichen and moss cover may be quite important. Plants may include mountain spleenwort (*Asplenium montanum*), pineweed (*Hypericum gentianoides*), sedge (*Carex pensylvanica, C. rosea*), huckleberry (*Gaylucassia* sp.) witchgrass (*Dicanthelium* spp.), oatgrass (*Danthonia spicata*), hairy lipfern (*Cheilanthes lanosa*), broomsedge (*Andropogon glomeratus*), goldenrods, and asters.

5) Right-of-Way

One community type that is frequently found in the park will be called a Right-of-Way (ROW) community. It is not a natural community, but will be discussed because it provides important habitat features. These are areas that are maintained by mowing or other means. They generally occur along roads, powerlines, parking areas and buildings. Those that are not mowed too frequently provide important habitat for species with moderate to high light requirements. Some of the most interesting examples occur at the powerline ROW at Gold Branch and near the helipad in Palisades West. Species are generally herbs, with small shrubs and tree seedlings. Herbs include a mixture of planted exotics, plus weeds such as Queen Anne's lace (*Daucus carota*), ragweeds (*Ambrosia artemesiifolia* and *A. trifida*), goldenrod (*Solidago* spp.), orchard grass (*Dactylis glomerata*), timothy (*Phleum pratense*), yarrow (*Achillea millefolium*), heal-all (*Prunella vulgare*), and white clover (*Trifolium repens*), as well as unusual native species such as Bartonia (*Bartonia virginica*), blue-eyed grass (*Sisyrinchium* spp.), and monkshood (*Aconitum uncinatum*).

Species Specific Discussions

A number of rare species occur within the CRNRA. Although somewhat concentrated in the southern units, the rare species are scattered among different units. The Georgia Natural Heritage Program maintains a systematic inventory of all known locations of rare species. See page40 for status symbols.

Ginseng

(*Panax quinquefolius*, G4/S3) occurs in two locations. The populations are always under threat of harvest and could easily be decimated.

Witch alder

(*Fothergilla major*, G3/S1) occurs on one forested slope.

Canada lily

(*Lilium* cf. *canadense*, G5/S2) is found in several wet forested areas. The locations are quite shady and no flowering or fruiting specimens were seen.

Bay starvine

(*Schisandra glabra*, G4/S2, state-T) occurs in one unit. The location is covered by a dense thicket of vegetation, which means high competition among plants. However, the vines seem to be quite healthy, twining up through the thicket.

Information from the website for Protected Plants of Georgia (Patrick, T.S., J.R. Allison, and G.A. Krakow, 1995) included the following information. *Schisandra glabra* is scattered across the Southeast from limited locations in Arkansas and Tennessee, south to Louisiana and east to northeastern North Carolina, on the Piedmont Plateau of Georgia, and disjunct on the Cumberland Plateau of southcentral Kentucky. Preferring rich, forested bottomlands and adjacent lower slopes, it is recorded from 16 counties in Georgia. This species is a deciduous, monoecious, woody vine with stems to three cm thick, twining up to the crowns of trees or trailing along the ground, even forming a ground cover. The alternate leaves are up to 15 cm long and six cm wide, ovate to elliptic, with sparsely toothed margins, and are sweet-smelling when crushed. The flowers of bay starvine are inconspicuous, maroon, and either solitary or in loose clusters It flowers from May to June, with fruits from July to August. Management recommendations include avoiding disturbance and controlling exotic weeds. At most this species will tolerate only hand thinning of trees in its immediate vicinity, and only if done carefully.

Biltmore carrionflower

(*Smilax biltmoreana*), while listed in adjacent states, is not on the official Georgia list. It is on the Georgia list of species for which further information is needed. This species is found scattered across a number of units.

Georgia aster

A small population of Georgia aster (*Aster georgianus*, G2G3/S2) was first found by Steve Bowling and Jerry Hightower in 1998.

Pink ladyslipper

One individual of pink ladyslipper (*Cypripedium acaule*, G5/S4, state-U), a new find for the park, was recorded. Further information (Patrick, T.S., J.R. Allison, and G.A. Krakow, 1995) indicated that ladyslippers are found in the foothills and mountains of Alabama, Georgia, South Carolina, adjacent Tennessee, and North Carolina, north to Canada. Recorded from 46 counties in Georgia, they are found in acid soils of pinelands, upland hardwoods with pine, occasionally on the edges of rhododendron thickets, and in mountain bogs. This perennial herb may reach up to 45 cm tall. It has two basal leaves that are hairy, with strongly raised, longitudinal veins and a single flower borne on a leafless flower stalk. The showy flower may appear from April to June.

Management recommendations for pink ladyslipper include avoiding disturbance, collecting, and competition from exotic weeds, as well as fire management. This species may require periodic forest thinning and winter burns at several-year intervals to maintain its pine-dominated habitat. Otherwise, the forest habitat may develop into a stand with too much shade or too many hardwoods. This species is

of horticultural interest and must be protected from collection.

Yellow ladyslipper

(*Cypripedium parviflorum*, G5/S2, state-U) was known to occur in numerous large populations in the past (Hightower, 1998). It is highly distressing to note that the known areas were searched numerous times during 1997 and 1998 by knowledgeable personnel and no individuals were found. No signs of digging were noted. To date, it is difficult to determine what happened to these plants. A future survey of the known areas would be helpful in determining if these populations are actually extirpated, or if they experienced odd growth seasons during the study period.

Patrick, T.S., J.R. Allison, and G.A. Krakow (1995) discuss *Cypripedium pubescens* as ranging from the foothills and mountains of Georgia and the Carolinas, west to Arizona, and north to Canada. Recorded from 35 counties in Georgia, it is found in rich, moist, hardwood coves and forests. A perennial herb, yellow ladyslipper may reach up to 70 cm tall. The 3-5 leaves are alternate, hairy, prominently ribbed or veined. The one or two showy flowers are terminal, appearing from April to June. Management recommendations include avoiding disturbance. It is of horticultural interest and must be protected from collection.

Indian olive

Nestronia (*Nestronia umbellula*; G4,S2, state-T) is known to occur close to park boundaries of the West Palisades unit, according to GNHP element occurrences. It could well occur within the park, blending in with other shrubs, but was not noted during this survey.

Ozark bunchflower

Another listed species found outside the boundaries but not within the park is Ozark bunchflower (*Veratrum woodii*; G5,S2 state-R).

Heartleaf goldenrod

The park provides natural areas in a region which is becoming highly urbanized, maintaining important habitats for numerous uncommon plant species. Some of the species that are either uncommon to the region or uncommon within the park were noted. Heartleaf goldenrod (*Solidago sphacelata*; G4G5, S3?), an interesting species known to grow on "rich calcareous cliffs" (GNHP, 1997a), was found in one unit. This species may reach up to one meter in height, though it is often shorter in stature due to its propensity to grow on exposed rock.

Boott's sedge

Of the many sedges noted during this project, two are listed as watch species in Georgia. Boott's sedge (*Carex picta*; G4G5, S3) is Georgia's only dioecious sedge. Another sedge (*Carex venusta* var. *minor*; G4T4, SR) is associated with peat bogs and wet, mossy woods.

Fine bulrush

(*Scirpus koilolepis;* now *Isolepsis carinata*) was found during this study. Previously it was not documented as occurring in the state of Georgia (Patrick, 1998).

Blazing star

(*Liatris graminifolia*), uncommon within the park, is found in an Upland Hardwood Forest community in one unit. Perhaps populations have gotten smaller with suppression of fire.

Cave alumroot

(*Heuchera parviflora*), while not state-listed in Georgia, is not a common species to the state. It is restricted to the limited dry, shady conditions provided under rock outcrops overhangs. These locations are usually at the base of cliffs, which are often subject to trampling impacts.

Trout lily and Indian physic

One population each of trout lily (*Erythronium americanum*) and Indian physic (*Porteranthes stipulata*) occur in the park. While both occur in Mixed Alluvial communities, trout lily is found in an alluvial flat close to the river while Indian physic occurs on a steep slope.

Beardtongue

(*Penstemon laevigatus*) occurs sporadically in rocky Upland Hardwood locations in three units.

Also rarely found in the park are **spring beauty** (*Claytonia virginica*), **Michaux's lily** (*Lilium michauxii*), **Oconee azalea** (*Rhododendron flammeum;* Hightower, 1998), **spider lily** (*Hymenocallis caroliniana*) and **jointweed** (*Polygala polygama*). **Rein orchid** (*Platanthera clavellata*) is found in a Wetland location in one unit.

Bird's-foot treefoil

The specimen of bird's-foot trefoil (*Lotus corniculata*), although a weedy exotic species that is probably fairly prevalent, appears to be one of the few records for the state.

Goutweed

(*Aegopodium podagraria*), another exotic species found in the study, is recorded for only two counties in the Georgia atlas (Jones and Coile, 1988).

Microhabitats within the park greatly add to the species diversity. A small mesic pocket along an unnamed tributary above the river confluence provides habitat for a number of unusual species.

Purple bluet

(*Houstonia purpurea*), though not nationally rare, is uncommon in the park and has a state ranking of SR.

Thin-leaved bluet and southern barren strawberry

(*Houstonia tenuifolia* and *Waldsteinia fragarioides* spp. *doniana*), are not state listed but are rare in the park. The main populations of these three species occur along a small unnamed tributary in one unit.

Mowed forest edges and openings provide an important habitat for numerous species. These locations (including the helipad, road edges, utility right-of-ways, and restroom facilities) provide conditions with increased light and somewhat decreased plant competition. These artificial openings may partially provide some of the conditions found during presettlement times that would have been created by frequent fires or by tree-fall gaps in mature forests. Some of the plant species found include **Bartonia** (*Bartonia verna*), **blue-eyed grass** (*Sisyrinchium* spp.), **skullcap** (*Scutellaria incana*), and other uncommon occurrences for the park.

Little plantain

(*Plantago pusilla*), appears to be a new record for the state. Generally having a midwestern range, it is not known if this species is native or naturalized to Georgia. It was found in a relatively open, weedy area within the park. Only one individual in poor condition was collected. Determination was made by Jim Allison and Tom Patrick of the GNHP. Since the discovery of this species came late in the project, a further search for little plantain is recommended.

Invasives

Control of invasive plants is a very serious issue for the CRNRA. Invasive exotic species can overtake a habitat, outcompeting natives for sunlight, nutrients, and space. The native species begin to disappear, along with other plant and animal species associated with them. **Kudzu** (*Pueraria lobata*) control at Gold Branch has been underway for two years. Some

control is being achieved, though more years of treatment may be necessary. Another aggressive weed which will need spraying is **English ivy** (*Hedera helix*). This species encroaches from the many office building plantings that surround the park. It can create a very thick ground cover in some areas, suppressing native vegetation. **Vermin grass** (*Microstegium vimineum*) is rapidly taking over some areas. To date, there are no known methods for slowing its expansion. An invasive species taking over aquatic habitats is **parrotfeather** (*Myriophyllum brasiliense*). At the time of this study, the park was beginning to address management issues for reduction of this species.

Acknowledgments

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BOOKSHELF

Field Guide to the Rare Plants of Florida
Linda G. Chafin
Florida Natural Areas Inventory,
Tallahassee, Florida

Always on the look out for new plant books, I was pleased to learn about a "Field Guide to the Rare Plants of Florida" by Linda Chafin. Many of you may know Linda, who is a Georgia Botanical Society member and occasional trip leader and is the senior botanist with the Florida Natural Areas Inventory.

Published in 2000 by the Florida Natural Areas Inventory (FNAI), Field Guide to the Rare Plants of

Florida fills a void in Florida plant books by providing readers with a compilation of 200 state and federally protected species. Pteridophytes, gymnosperms, angiosperms and lichens are included, covering all parts of the state. The book is in a 9" X 7" three-ring binder. In the introduction, the author explains.

"The Field Guide to the Rare Plants of Florida is designed to be used in the field and to be customized by each user. The 3-ring binder format and unnumbered pages allow users to arrange the species accounts in any way that is convenient: by common or scientific name, county, flower color, water management district, etc. This format will also facilitate future updates and additions to the guide."

The book has five sections separated by tabbed dividers: introductory material, Natural Communities, Species Accounts, References and Glossary. The introduction begins with a forward by Gary L. Evink, State Ecologist with Florida Department of Transportation and is followed by an impressive list of acknowledgments. The section is rounded out with "Using the Field Guide," which details the information included for each species.

Fifteen communities are listed in the Natural Communities section, each with a description, a list of synonyms and a list of public lands with exemplary occurrences. The author states that "these natural community descriptions are brief and cover only communities known to support a large number of rare plant species." Several excellent books on Florida ecology are mentioned as references. Common names are used in the descriptions with a list of corresponding scientific names at the end of the section. It is interesting to note how many of Florida's rare communities are dependent on fire.

The Species Accounts section contains treatments for each of the above mentioned 200 species. Information given for each species includes common and scientific names, synonyms, family name, Florida county distribution map, FNAI rarity ranks, legal status, wetland status, photographs, field descriptions, similar species, related rare species, habitat, best survey season, range-wide distribution, conservation status, protection and management recommendations, references and line drawings. Each of these categories is discussed; FNAI ranks, legal status, and wetland status are defined in the introduction. Characters given are readily observable in the field, and additional information is given to help separate the species from common plants that might be confused with the featured rare species. The color photos, which are primarily by Gil Nelson, are great. For most species, there are two or even three photos which illustrate the habit of the species and pertinent features close-up. The line drawings by Jean C. Putnam Hancock are quite detailed and wonderfully illustrate characteristics not apparent in the photos.

One feature I particularly like is the use of English measurements. The author explains: "Field descriptions are written with a minimum of technical terms, and measurements are given in English rather than metric units, to encourage use of this manual by people from a wide range of backgrounds." A brief glossary is included to cover those terms which might be unfamiliar.

Throughout the guide, references are made to web sites and to numerous books and papers on Florida botany. These are all listed in an impressive sixteen pages of "Cited References" to over 350 botanical works. That the author has enlisted the help of so many reviewers and consulted so many references assures the reader of the accuracy of the information.

This book brings together many species not previously published in one book and provides users both professional and amateur a handy reference to Florida's rare plants. Anyone interested in Florida or protected species will want to have this book for their library. It can be purchased for $35 from:

Florida Natural Areas Inventory
1018 Thomasville Rd., Suite 200-C
Tallahassee, Florida 32308
850-224-8207 www.fnai.org

Reviewed by Carol Howel Gomez

The National Vegetation Classification System

Thomas E. Govus

The irrepressible human urge to name the things that surround us, the one that compelled Carolus Linnaeus to create the scientific system of nomenclature for plant species in the mid 1770's, has also been a force exerted upon those who seek to describe and understand ecological communities. As explained by an early professor of mine in regard to plant systematics, humans by nature are uncomfortable until they can apply a name to something. The problem with plant communities is that these are systems that, by their very nature, are complex and can consist of (in some cases) a hundred or more species of vascular plants. They occur over a vast variation in topographic, climatic, geological and edaphic conditions. Given the lack of stability in even naming plant species these days what are the hopes for a standardized system for naming plant communities?

A number of different systems have been developed to address this problem and applied in limited ways in different parts of the world in recent times. I recall many paper sessions I attended as a graduate student where Dr. Albert E. Radford would regularly present his own system of naming plant communities. No force existed that would allow any one of these competing ideas to gain ascendancy and become *the* system.

From the mid-1970's onward, some progress was made with the development of the states' Natural Heritage Programs. These programs were begun as a collaboration between the Nature Conservancy and state governments. South Carolina has the honor of being the first to establish a Natural Heritage Program. The objective of these programs was to gather information on rare plants and animals as well as natural communities. Each state independently developed their own unique list of natural communities in response to their own needs. Some of these include Schafale and Weakley (1990) for North Carolina and Nelson (1985) for South Carolina. By the 1990's the limitations of this methodology became apparent, in that there was no agreement for naming similar communities in particular physiographic provinces from state to state. For those interested in the emerging concept of ecoregional planning, including the Nature Conservancy, the need for a standardized, uniform system of identifying, describing and naming plant communities throughout the natural regions in which they occur became essential.

During the 1990's the Nature Conservancy (with support of the US Forest Service, the US Geological Survey, the National Park Service, the US Fish and Wildlife Service, the Department of Defense, the TVA and others) began the long process of developing such a system. A number of scientists with expertise in plant communities were hired to devote themselves exclusively to this task. Countless meetings across the country were conducted and a framework agreed upon. The starting point was the World Physiognomic Classification of Vegetation (1973), developed by UNESCO (United Nations Educational, Scientific and Cultural Organization). This system primarily uses structural characteristics of vegetation as a basis of classification. The

upper levels of this system were modified to provide more consistent application of criteria to define the levels of the hierarchy. Supporting information was also developed to further improve consistency of application. Additional changes involved: the allowance for finer scale applications, particularly with wetlands; an inclusion for distinguishing between natural/ semi-natural vegetation vs. managed or culturally modified vegetation; and the use of hydrologic modifiers based on Cowardin et al. (1979) to make the system compatible with wetland mapping efforts already employed across the US.

Figure 1 shows the structure of the National Vegetation Classification system (NVC) and provides an example for a typical community. It begins with a hierarchy based on the structure of the vegetation (forest, woodland, shrubland, herbaceous vegetation, sparse vegetation). It also includes, in successive layers, information on leaf phenology (evergreen, deciduous or mixed evergreen-deciduous); leaf characteristics (broad-leaved, needle-leaved, sclerophyllous) including the climatic situation (subtropical, temperate, cold-deciduous); the "naturalness" of the vegetation; and broadly defined environmental factors such as elevation and hydrologic regime (e.g. lowland saturated, temp flooded, tidally flooded).

Below these physiognomic levels are the floristic levels. This is where the classification begins to approach the appearance of the Linnaean system. Dominant or diagnostic species from various levels of the community beginning with the canopy, sub-canopy, shrub, the herbaceous layer and even lianas or

Figure 1. An example of a classified community showing the National Vegetation Classification hierarchical structure. This community is the globally rare "Monticello glades."

Level	Primary Basis for Classification	Example
Class	Growth form and structure of vegetation	Forest
Subclass	Growth form characteristics, leaf phenology	Deciduous Forest
Group	Leaf types, corresponding to climate	Cold-deciduous Forest
Subgroup	Relative human impact (natural/ seminatural, vs. cultural)	Natural/Semi-natural
Formation	Additional physionomic and environmental factors, including hydrology	Seasonally Flooded Cold-deciduous Forest
Alliance	Dominant/diagnostic species of the uppermost or dominant stratum	*Quercus phellos* Seasonally Flooded Forest Alliance
Association	Additional dominant/diagnostic species from other strata in the community	*Quercus phellos-Q.* (*michauxii, shumardii*)- *Fraxinus americana*/ (*Quercus ogelthorpensis*)/ *Zephyranthes atamasca* Gabbro Upland Depression Forest

Figure 2. Longleaf pine loamhill woodland at Fort Benning, GA. The scientific name under the NVC is "*Pinus palustris / Schizachyrium scoparium* Upper East Gulf Coastal Plain Woodland. Maureen Mulligan of TNC is shown collecting data for improving the NVC.

epiphytes are used to define the various Alliances and Associations. Species in the same stratum are separated by a hyphen, those in different strata are separated by a slash. Species less consistently found in various levels of the community are sometimes included in the name surrounded by parentheses. The Association is the finest level of the classification. Alliances (similar to the generic level for the Scientific Nomenclature System) are broader groups and consist of a collection of related associations. Figure 2 shows a photograph of a restricted type of plant community in Georgia, a longleaf pine loamhill woodland occurring at Fort Benning (currently being studied by TNC and NatureServe), and provides the NVC scientific name being used for this association.

It is important here to point out that when provided with a scientific name for an association one may easily be mislead into thinking these are as distinct and fixed as those names for a particular plant or animal. As explained to me, it is very important to realize that "the name is just the name". What is really important in understanding and applying these names to a particular association is the concept behind the name. In order to appreciate and understand this concept one has to read and research the ideas used to define the association.

Current Status and Applications

After more than ten years of work, an initial publication of the results of the classification was produced for the Southeastern US (Weakley, A.S., K.D. Patterson, S. Landaal, M. Pyne, and others. 1998). Various agencies involved with land management including the National Park Service, the US Forest Service, the Department of Defense, the Nature Conservancy and others have been in the process of identifying, mapping and conducting inventories of communities employing this system. In many instances this is a symbiotic process whereby data collected for the process of naming the plant communities also serves to reinforce and strengthen the classification system. By necessity, the initial classification was based on literature and whatever qualitative and quantitative data was on hand to develop alliances and associations. To improve and refine this system, standardized methods of collecting data in the field using measured plots and a consistent approach to collecting quantitative data on the composition and structure of plant communities has been widely implemented. Most of the National Forests in the Southeast have been inventoried and this data analyzed and fed back into the classification system. One of the principal goals of this system from the beginning was the

Figure 3. The Monticello glades a *Quercus phellos* - *Quercus* (*michauxii, shumardii*) - *Fraxinus americana* / (*Quercus oglethorpensis*) / *Zephyranthes atamasca* Gabbro Upland Depression Forest.

creation and inclusion of global ranks for assessing the rareness of different communities. For example, during a recent reconnaissance of plant communities on the Oconee NF, the botanically famous "Monticello glades" were visited and many examples of these unusual wetland forests were sampled. Based on what is known about the occurrence and distribution of these systems that are developed over a rather limited and highly unusual geologic substrate (gabbro), this community type is regarded as a G2? entity (indicating that is believed to be imperiled globally). It is restricted to occurrences known only from Jasper County, Georgia and York County, South Carolina. The scientific name for this globally rare community is: *Quercus phellos - Quercus (michauxii, shumardii) - Fraxinus americana / (Quercus oglethorpensis) / Zephyranthes atamasca* Gabbro Upland Depression Forest. Quite a mouthful. Figure 3 shows a photograph of this community.

One important development in conservation strategy that is allowed by the NVC is the "coarse filter" approach to protecting biodiversity. Most people who become interested in protecting rare plants begin by focusing at first on the individual elements of plant communities. As experience widens your view, you eventually come to realize these species are usually dependent upon special habitats (it's the habitat, stupid). By developing standardized concepts of plant communities and using consistent criteria to evaluate the quality of the occurrence of these broader collection of plant elements, the job of deciding on conservation targets is often facilitated. There are now several documented cases in which properties were acquired solely on the basis of the presence of unique (G1, G2) plant communities only to find, through later inventories, that endangered and threatened species (in some cases, species new to science) were also protected. This use of the National Vegetation Classification provides a much more efficient tool in identifying and protecting natural areas.

As the National Vegetation Classification has continued to be developed and applied across the United States, the work of maintaining and continuing the refinement of this system has come to be the responsibility of a group of ecologists who belong to a new independent organization called NatureServe. This nonprofit organization was created in 1999 as a "spin-off" from The Nature Conservancy and works in cooperation with the Natural Heritage Network and assists land managers such as the National Park Service, the US Forest Service, the Department of Defense and others who are committed to identifying and protecting biodiversity. These scientists are also involved with the development of an entirely new database that will replace the aging Biological Conservation Datasystem (BCD). This new system is referred to as the Heritage Data Management System (HDMS) and will modernize and facilitate the collection and analysis of data on rare plants, animals and natural communities. It is vitally important work and goes to the heart of preserving biodiversity. NatureServe has also produced an extremely useful Web site (www.natureserve.org/explorer/) that provides up-to-date information regarding the taxonomy, conservation status and distribution for most of North America's plant and animal species. It also includes an up-to-date, searchable database of all of the currently defined alliances and associations within the NVC. Anyone with an interest in our natural heritage should visit this site and take advantage of the information that is offered there.

The development of the National Vegetation Classification system has been a tremendous undertaking and has involved the dedication of a large number of community

ecologists, Natural Heritage scientists and data managers working together over a long period of time. If one is serious about identifying and protecting biodiversity, the need for some uniform system of naming plant communities is one essential starting point. When you think about the diversity and complexity of the flora of the Southeast, and the range of communities extending from tidal herbaceous vegetation in the Coastal Plain to boreal high elevation spruce and fir forests of the Blue Ridge, you realize what a job this is. It is a wonderful tribute to our planet that such a difficult and demanding effort has been made.

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The Elusive Hartwrightia

Hugh Nourse

Hartwrightia floridana (Asteraceae) is the only species in the genus. Endemic to Georgia and Florida, *Hartwrightia* is listed as threatened in both states. In Florida, *Hartwrightia* has been found in 59 counties, and in Georgia, only in Camden, Charlton and Ware counties.

My wife, Carol, and I have been working with Tom Patrick[1] to provide better photographic slides of some of the protected plants of Georgia. *Hartwrightia* was missing from DNR's slide library. Tom provided the specific location for three known sites around Folkston and St. George (Charlton County). We were told to search in wet ditches beside the road for the conspicuous lavender flower heads, which resemble sea lavender (*Limonium carolinianum*), and which bloom during September through November.

In September 1999, we packed our gear and drove to Folkston. Usually, we photograph in the evening light, then arise early to catch the morning light at the same site. On arriving at the vicinity, we began to search using the detailed directions. Our first problem was that the directions described the first site as just past a bridge. However, there was a culvert under the road before the bridge and we later learned that the word "bridge" in the directions actually referred to the culvert, not the bridge. Of course, we did not find it "beyond the bridge." We widened our search up and down the road, and even included the right spot near the culvert, but did not find *Hartwrightia*. We had no better

Fig. 1

Fig. 2

luck at the two other sites, and were beginning to think we were not very good searchers as we returned home without photographic images.

We returned October 21-22, 1999 and again November 14th, and systematically drove the roads around Okefenokee Swamp searching ditches for the elusive lavender flowers. Every time we saw the similar *Carphephorus*, we hoped we had found *Hartwrightia,* and became temporarily excited, but did not find a single plant of Hartwrightia that year.

After more discouraging searches the following year, I spotted some lavender flowers about the right height at a damp roadside in Suwanee Recreation Area on 28 October 2000. All the identification characteristics were checking out! The basal leaves were narrowly elliptical and had long slender leaf stalks (Figure 1). The stem leaves were reduced and alternate (Figure 2). We pulled out our hand lenses and looked for tiny, resinous pits (depressions) on the leaves and stems. Yes, they were there! The flower heads were in highly branched, flat-topped clusters (Figure 2). The flower heads were white to lavender and had only disk flowers (Figure 3). We immediately set up our equipment and began photographing.

Given previous experiences with mistaken identification of rare plants, we were still not absolutely positive that we had found *Hartwrightia*. After our film was developed, we took the slides to Tom Patrick for verification. We were incredibly pleased to learn that not only had we found *Hartwrightia*, we had found a site not previously recorded! It was fun to watch Tom place the new site on DNR maps. It was also gratifying to hear that in 2001 our new site had been visited by a researcher conducting further studies on the genus.

Hartwrightia was originally discovered in Volusia County, Florida in 1886 by Samuel Hart Wright (1825-1905). Two years later, Sereno Watson named the genus in the discoverer's honor. So far, we have been unable to find out much about Dr. Wright except that he was a physician, astronomer and botanist whose herbarium collection of 15,000 species is in the Cleveland Natural History Museum, Cleveland, Ohio. The first collection of the species from Georgia was made by collectors from Biltmore Herbarium from a site near Folkston in 1900.

Very little is known about the biology of *Hartwrightia* and this is an opportunity for someone who is searching for a project. Dr. Ed Schilling, University of Tennessee, is conducting research on the genetic evolution of the species. He has some exciting preliminary and unpublished findings about the relationships of this species. He was very forthright in sharing information with us, but it would be premature to include it here. Do keep an eye out for his upcoming revelations about *Hartwrightia*.

The Nature Conservancy and the Natural Heritage systems rank *Hartwrightia* as G2, which means the plant is globally imperiled. For Florida, their ranking is S2 (imperiled in Florida); and in Georgia, their ranking is S1 (critically imperiled in Georgia) which reflects the rarity in Georgia. Dr. Daniel B. Ward (1979) states that researchers "have been unsuccessful in relocating plants of *Hartwrightia* in areas where it was formerly collected." This may indicate that the species is more imperiled than historical records show.

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NatureServe Explorer: An online encyclopedia

Continues on page 40

Fig. 3

Rare Species Status &Rank

STATE [GLOBAL] RANK

S1[G1] Critically imperiled in state [globally] because of extreme rarity (5 or fewer occurrences).

S2[G2] Imperiled in state [globally] because of rarity (6 to 20 occurrences).

S3[G3] Rare or uncommon in state [rare and local throughout range or in a special habitat or narrowly endemic] (on the order of 21 to 100 occurrences).

S4[G4] Apparently secure in state [globally] (of no immediate conservation concern).

S5[G5] Demonstrably secure in state [globally].

SA Accidental in state, including migratory or wide-ranging species recorded only once or twice or at very great intervals.

SN Regularly occurring, usually migratory and typically nonbreeding species.

SR Reported from the state, but without persuasive documentation (no precise site records and no verification of taxonomy).

SU[GU] Possibly in peril in state [range-wide] but status uncertain; need more information on threats or distribution.

SX[GX] Apparently extirpated from state [extinct throughout range]. GXC is known only in cultivation/captivity.

SE An exotic established in state. May be native elsewhere in North America. Sometimes difficult to determine if native (SE?).

SH[GH] Of historical occurrence in the state [throughout its range], perhaps not verified in the past 20 years, but suspected to be still extant.

[T] Taxonomic subdivision (trinomial, either a subspecies or variety), used in a global rank, for example "G2T2."

Q Denotes a taxonomic question - either the taxon is not generally recognized as valid, or there is reasonable concern about its validity or identity globally or at the state level. ? Denotes questionable rank; best guess given whenever possible (e.g. S3?).

FEDERAL STATUS (US Fish and Wildlife Service, USFWS)

LE Listed as endangered. The most critically imperiled species. A species that may become extinct or disappear from a significant part of its range if not immediately protected.

LT Listed as threatened. The next most critical level of threatened species. A species that may become endangered if not protected.

PE or PT Candidate species currently proposed for listing as endangered or threatened. C Candidate species presently under status review for federal listing for which adequate information exists on biological vulnerability and threats to list the taxa as endangered or threatened.

PDL Proposed for delisting.

E(S/A) or T(S/A) Listed as endangered or threatened because of similarity of appearance.

(PS) Indicates "partial status" - status in only a portion of the species' range. Typically indicated in a "full" species record where an infraspecific taxon or population has U.S. ESA status, but the entire species does not.

STATE STATUS

E Listed as endangered. A species which is in danger of extinction throughout all or part of its range

T Listed as threatened. A species which is likely to become an endangered species in the foreseeable future throughout all or parts of its range.

R Listed as rare. A species which may not be endangered or threatened but which should be protected because of its scarcity.

U Listed as unusual (and thus deserving of special consideration). Plants subject to commercial exploitation would have this status.

Continued from page 39

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[1] state botanist, Georgia Department of Natural Resources, Natural Heritage Program.

from Western Carolina University, where his major professor was Dan Pittillo. While there, he conducted a protected plant survey along the Blue Ridge Parkway from Virginia to the Smokies. Tom has been doing contract botanical work, off and on, for 25 years. During this time he has worked for The Nature Conservancy, Natureserve, National Forest Service, National Park Service, and the Georgia Natural Heritage Program. Recently, he has worked with Alan Weakley, who is working on a flora of the Carolinas and Virginia, and also The National Vegetation Classification System.

HUGH NOURSE

Hugh has served as Field Trip Chair, Vice President and President of the Georgia Botanical Society. He and his wife, Carol, are authors/photographers of two books: *Wildflowers of Georgia* and *The State Botanical Garden of Georgia* (both published by the University of Georgia Press, Athens, Georgia, in 2000 and 2001). Their articles and photographs have appeared in *The American Gardener*, *Wildflower* magazine, *Nature Photographer* and *Tipularia*. Photo credits include these magazines as well as books: Wilbur and Marion Duncan's *Wildflowers of the Eastern United States* and *Endangered Wildlife and Plants of the World*. The photographs are theirs.

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Hartwrightea
Hartwrightea floridana
by Hugh Nourse

Shoals Spider Lily
Hymenocallis coronaria
by Fred Mileshko